Cross-Dialectal Differences in Vowel Identification

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ABSTRACT

The acoustic vowel space of one dialect of the American English language compared to another is often systematically and significantly different. Usually, these dialects will have the same basic set of systematic phonemic distinctions among vowels. It is the pronunciations of this same set of vowel phonemes that differs from one dialect to another. What has not been studied is individual listener's ability to distinguish their native dialect from another similar. This research study examines two Midwestern dialects of American English. The dialects of Central Ohio and of Southeast Wisconsin have many similarities in regards to vowel placement. However, they differ (in terms of their "acoustic vowel spaces") in that the Wisconsin dialect is undergoing what is called the "Northern Cities Shift" in which several vowels have jointly shifted from their positions in the F1 by F2 acoustic vowel space as found in the Ohio dialect.

Using a customized MATLAB computer program, two perception tests were developed in order to test Central Ohio listeners' ability to differentiate their native Ohio dialect from that of Wisconsin. The stimulus vowels in this perception test were produced by both male and females speakers ranging in ages of 8-12, 35-50, and 66+ from both dialects. The listeners, all of which are between the ages or 20–35 and have been born, raised, and spent the majority of their life in Central Ohio**.** The first test required listeners to identify the vowels, produced in the [h_d] format (labeled with the words: *heed, hid, head, hey'd, had, hod, who'd, hood, hoed, heard, hide, hawed*). The second test required listeners to identify the dialect of the speaker based only on the single stimulus item. The results will be discussed in terms of similarities and differences in the confusion matrices between different dialects.

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Chapter 1: INTRODUCTION

There are many different human languages most of which are mutually incomprehensible. These languages can differ along a large number of linguistic variables including syntactic rules, semantic rules, lexicons, phonological rules and phonetics. In terms of phonetic differences, languages can differ in terms of the number and nature of consonants as well as vowels. However, practically every human language itself has different varieties, called *dialects*, which are particular to a region of the country (a so-called "regional dialect") or group of people associated by ethnicity or social class (a so-called "social dialect"). Usually, one general dialect is considered to be the *standard dialect* of that language. In American English, this is called standard *American English* or SAE. In British English it is called *Received Pronunciation* or RP. Dialects that are different from the standard are often called "non-standard dialects." However, in this paper we will refer to "regional dialects" rather than select one or another of the dialects as representing "the" standard. Quite frankly, the regional dialect spoken by these individuals can be seen as the "standard" of that region.

While the dialects of a particular language are generally considered to be mutually comprehensible, there may be quite dramatic distinctions between them in terms of lexical items used and syntactic patterns. However, among English dialects, variations in terms of the phonetic and phonological structure of vowels are especially noticeable (compare, for example, the vowel sounds produced by speakers from Boston, Maine and Western North Carolina). These dialect variations are systematic across the linguistic system of the speakers of these dialects

When one is listening to different dialects being spoken, you can recognize speech production differences. However, what is also likely to be present is the differences in how the speaker *perceives* speech that are related to the specific phonological/phonetic rules of that speaker's dialect. For example, researchers have looked at the perception of vowel mergers by speakers of dialects who either have or do not have the vowel merger. For example, in Ohio English most speakers do not have a difference between the vowels in cot and caught producing them both a [ɑ], whereas speakers in North Carolina usually do have a difference, producing them with the vowels [ɑ] and [ɔ], respectively. Thus, you have a vowel merger (/ɑ/ and /ɔ/ are both produced as [ɑ]) in central Ohio English. Several studies (Bowie, 2000; Janson & Schulman, 1983; Labov, Karan & Miller, 1991) found that speakers of dialects that have merged the vowels are less able to discriminate between instances of those two vowels than speakers from a dialect that has not merged the vowels. One goal of the present study is designed to compare the abilities of subjects from two different regional dialects (as spoken in Central Ohio and Southeastern Wisconsin) to correctly identify vowels produced by speakers of their own dialect as well as a different dialect.

Another research direction being followed here is to examine how well these same subjects can correctly identify the regional dialect of the speaker based only on a single word. This type of research has been conducted for several decades. For example, Giles, 1970 and Labov, 1972, required listeners to judge and rate talkers based on the correctness and likeability of their speech (Giles, 1970; Labov, 1972; Labov, Ash, & Boberg, 2006; Preston, 1993 as cited in Clopper & Pisoni, 2004). Preston (1993) moved from categorizing talkers by type/style of dialect to categorization dialects by their city of

origin. Listeners from Michigan and Indiana listened to nine male talkers from different cities, ranging as far south as Dothan, Alabama to as far north as Saginaw, Michigan. The listeners had to choose from which of the nine possible cities they thought each speaker originated. The results indicated that the listeners were able to make differentiations from the Northern and Southern talkers. However, their ability to do the same with the Northern and Midland talkers was reasonably worsened (Preston, 1993 as cited in Clopper & Pisoni, 2004).

Recent research studies on dialect perception, like that of Clopper & Pisoni (2004 and 2006), have evolved to more open-ended categorization studies that looked at American English dialect perception in a general way. In 2004, Clopper and Pisoni's study had 18 listeners from the University of Indiana listen to 66 male talkers of varying dialects from the "TIMIT corpus of spoken sentences. The listeners were asked to categorize the talkers into 6 pre-determined regional dialect groups Although the performance of the listeners was unsatisfactory (low), the results showed that the listeners were able to categorize the talkers into three more general dialect groups, South, West, and New England. These findings show that naïve listeners have an innate ability to distinguish different dialects from one another without additional training" (Clopper & Pisoni, 2004).

Clopper and Pisoni expanded upon their first experiment using a similar corpus of talkers from six dialectal regions, and used 99 listeners who varied not only by region of origin, but also by mobility. The listeners ranged in terms of mobility (mobile vs. non-mobile) and geographic location (Northern vs. Midland) creating four categories based on the possible combinations; the purpose was to see if the mobility and location affected the categorization method of the listeners. They listened to sentences spoken by the NSP

corpus talkers and placed them into the 6 dialectal categories. While listeners still performed poorly, study did indicate that location of origin and amount of mobility did play a role in how the listeners categorized the talkers into the 6 groups (Clopper & Pisoni, 2006).

The studies discussed thus far involved listeners matching talkers with pre-labeled dialectal groups. Clopper and Pisoni's study (2007) instead used a "free classification" method where listeners decided on dialect groups with no pre-labeled categories. 22 listeners were recruited to listen to 66 talkers (11 from each of the 6 dialect groups: North, North Midland, South, South Midland, New England, and West) from the same TIMIT corpus as used in their previous study (Clopper & Pisoni, 2004). Listeners were free to make as many or as little groups for as many or as little numbers or talkers in each. This was also done in a second experiment using forty-eight talkers from the NSP corpus comprised of both males and females representing each of the six dialect regions (Clopper & Pisoni, 2007). Although both experiments yielded a large percent of error, listeners classified with greater accuracy using the "free classification" method compared to classifying using predetermined categories.

All of the studies that have been conducted in the field of dialect perception are important and have made a lasting mark on the way research is currently conducted in this field. However, the majority of the studies investigating dialect perception have involved listeners matching speakers to one of 6 categorical dialects. Many of these studies indicate that listeners have some innate ability categorize and distinguish talkers from dialects different from their own (see studies referenced above: Clopper & Pisoni, 2004, 2006, and 2007). What has not been studied is individual's ability to distinguish his

or her own native dialect from another very similar dialect. The present study uses two very similar North American English dialects: the Midland and the Inland North. The Midland dialect is comprised of states in the central area of the United States including parts of Oklahoma, Kansas, Nebraska, Missouri, Iowa, Indiana, Illinois, and Ohio. The subjects representing the Midland dialect in this study are from the Central Ohio area, which is in the heart of the Midland dialect. The Inland North dialect is comprised of the states in the central Northern region of the United States including parts of Ohio, New York, Indiana, Illinois, Michigan, and Wisconsin. The subjects representing the Inland North dialect in this study are from the Southeastern Wisconsin area.

The primary differences between most regional dialects involve the acoustic-phonetic characteristics, particularly differences in vowels. The Inland North dialect is features what is often referred to as the "Northern Cities Shift" (Jacewicz et al., 2006). This affects several vowels, which have jointly shifted from the position found in the Midland dialect. Only a few vowels in the Inland North dialect are affected by this shift, and the remaining vowels have similar positions to the Midland counterparts. The similarities and differences in the vowel position of both the Midland and the Inland North dialects bring to light new questions. To what degree are listeners aware of these differences and/or sensitive to them when making linguistic decisions regarding dialect? How sensitive are listeners to words that differ only in terms of a single vowel? Can listeners of these dialects, Midland and Inland North, detect the vowel and dialectal differences between speakers form their own dialect and the foreign one? It is hopeful that the results from this research study will answer the above-proposed questions. This study will be examining both the Ohio (Midland) listeners' and the Wisconsin (Inland North) listeners'

sensitivity to distinguish their own native dialect and vowels, be it Midland or Inland North, from that of the foreign dialect and vowels.

Chapter 2: METHODS

Experiment: Vowel Identification in the [h_d] format

2.1 Speakers

120 male and female speakers ranging in age from 8-80 years recorded the stimuli for perception test. Of the 120 speakers, 60 were from the Midland dialect (Central Ohio) and 60 were from the Inland North Dialect (Southeastern Wisconsin). The 60 speakers were broken down by age and gender (6 groups of 10 speakers each: males ages 8-12, females ages 8-12, males ages 35-50, females ages 35-50, males ages 66-80, and females ages 66-80). The speakers were paid $15.00 per recording session; each session lasted approximately 1 hour. Every speaker was recorded in a sound-attenuating both using a head-mounted microphone one inch from the speaker's mouth.

2.2 Stimuli

Each of the 120 participating speakers produced 12 vowels of American English in the [h_d] format yielding the following existing and nonsense words: *heed, hid, hey'd, head, had, hod, who'd, heard, hide, hoed, hood, and hawed*. Each speaker produced each of these words three times. Only one of the three productions of each of the 12 [h_d] words was selected as the best production (i.e., fluently produced with little or no extraneous noise). Of twelve produced words, six were selected randomly for every speaker as the perception stimuli. The selected 720 stimuli, which varied in terms of dialect, gender, and age, were amplitude normalized using Adobe Audition 1.0 waveform editing program to

reduce possible differences in intensity (such as due to speakers' voice qualities or recording level) within the stimulus set for perceptual testing.

2.3 Procedure

The experiment was computer controlled by custom MATLAB program. The 720 stimulus words were presented randomly in 3 experimental blocks (240 stimuli in each block). In the recording of the data, the dialects were coded such that "1" represented the Ohio dialect, and "2" represented the Wisconsin dialect. Not only were the dialect of the speaker randomly selected, but the speakers' age and gender were also randomized. Each of the three sets had a different randomization order and all three sets were presented to each listener in the perception test.

Listeners identified the vowels using a 12-button response window displayed on a 17" computer screen containing all 12 words (1 word per button). The experiment was conducted in the Speech Perception and Acoustics Lab at The Ohio State University. Each listener was tested individually in a sound-attenuating both and was facing a computer screen and wearing high quality circumaural headphones (Sennheiser HD 600). The stimuli were delivered through the headphones at a comfortable listening level (~70 DB HL).

2.4 Listeners

Two groups of listeners completed the perception test, a native Midland (Central Ohio) and a native Inland North (Southeastern Wisconsin) group. The Central Ohio group consisted of 16 listeners, 12 female and 4 male all of whom were between the ages of 19-

23 and have been born, raised, and spent the majority of their lives in the Central Ohio region. The Southeastern Wisconsin group consisted of 17 listeners, 14 female and 5 male all of whom were between the ages of 17-23 and have been born, raised, and spent the majority of their lives in the Southeastern Wisconsin region. All listening participants had no reported speech or hearing disorders. Every listener was paid for his or her participation time at a rate of $10.00 per hour. Each experiment lasted approximately 1 hour.

2.5 Statistical Analysis

The output file from each of the 23 listeners was then converted into excel spreadsheets and then further analyzed through SPSS statistical program. Descriptive statistics were used (Cross-tabulations) to first create summary of responses for each individual subject. This was done to insure that none of the participants responded randomly or was biased toward a specific vowel sound. For example, if a listener chose one response more frequently across the set (such as choosing *head* in response to words like *who'd, hood, heed, hide* which normally are not confused with *head*), the responses from such listener were considered unreliable and this subject was excluded from the results. Only one of the Wisconsin listeners was excluded from the data set.

Next, Cross-tabulations were used to obtain mean responses of each listener group (Ohio and Wisconsin). Identification matrices were then created which contained both "correct" responses (i.e. vowels identified as intended by the speaker) and vowels confused with others. The confusion matrices showed the percentage of responses to the 12 possible vowels per the intended stimulus vowel. A total of 6 matrices were created: 3

for the Ohio listeners' data for each speaker age group (8-12, 35-50, and 66-80) and 3 for the Wisconsin listener's data for each speaker age group (8-12, 35-50, and 66-80). For each matrix, the responses were split by speaker dialect so that every matrix included information from the Ohio speakers and the Wisconsin speakers. These matrices will be shown and further discussed in the following sections.

Chapter 3: RESULTS AND DISCUSSIONS

The results of the perception tests will be evaluated and discussed into two different ways. First, the percentage of times that the vowels were identified as intended by the speaker (so called "correct" responses). The following diagonals on the confusion matrices represent these percent correct responses. We will also look at the pattern of confusions; that is, if the listeners did not identify the vowel with the quality in which the speaker intended, what was the vowel category chosen? All twelve vowels are represented in every confusion matrix—the rows indicate the intended vowel category, the columns represent the vowel responses provided by the listener. Although there was a high degree of accuracy in identification of these words and vowels across all listeners and speakers, there were also words and vowels that were very frequently confused. This section will only discuss the accuracy of the intended stimuli. The patterns of vowel confusions will be discussed in the next chapter.

3.1 Central Ohio (Midland) Listeners' Responses

Table 3.1 through 3.3 provides the responses for the Ohio listeners to both the Ohio speakers and the Wisconsin speakers.

Table 3.1

Age Group of Speakers: Children (ages: 8-12)

Listeners:OH young adults, hVd_vowel_ID, responding to WI and OH speakers (males and females)														
dialect	**spk_age**	**intended**	**HEED**	**HID**	**HEYD**	**HEAD**	**HAD**	**HOD**	**WHOD**	**HEARD**	**HIDE**	**HOED**	**HOOD**	**HAWED**
WI	A0	heed	**96.9**	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WI	A0	hid	0.0	**83.8**	0.0	15.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WI	A0	heyd	1.3	1.9	**91.3**	3.8	0.0	0.0	0.0	1.3	0.6	0.0	0.0	0.0
WI	A0	head	0.0	0.6	0.0	**80.0**	18.8	0.0	0.0	0.6	0.0	0.0	0.0	0.0
WI	A0	had	0.0	0.0	0.0	2.5	**97.5**	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WI	A0	hod	0.0	0.0	0.0	0.0	18.8	**56.3**	0.0	0.0	8.1	0.0	0.0	16.9
WI	A0	whod	0.0	0.0	0.0	0.0	0.0	0.6	**91.9**	0.0	0.0	2.5	5.0	0.0
WI	A0	heard	0.0	0.0	0.0	1.9	0.0	0.0	0.6	**97.5**	0.0	0.0	0.0	0.0
WI	A0	hide	0.0	1.3	0.0	0.0	1.3	0.0	0.0	0.0	**97.5**	0.0	0.0	0.0
WI	A0	hoed	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	**98.1**	0.0	0.0
WI	A0	hood	0.0	0.0	0.0	0.0	0.0	1.9	0.0	3.8	0.0	0.0	**94.4**	0.0
WI	A0	hawed	0.0	0.0	0.0	0.6	4.4	57.5	0.0	0.0	0.0	0.0	0.0	**37.5**
OH	A0	heed	**97.5**	1.9	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OH	A0	hid	0.0	**73.8**	1.9	23.8	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0
OH	A0	heyd	0.0	0.0	**91.3**	6.3	0.6	0.0	0.0	1.3	0.0	0.0	0.0	0.6
OH	A0	head	0.0	0.0	0.0	**91.3**	8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OH	A0	had	0.0	0.0	0.0	0.6	**98.8**	0.0	0.0	0.0	0.6	0.0	0.0	0.0
OH	A0	hod	0.0	0.0	0.0	0.0	5.0	**57.5**	0.0	0.0	0.6	0.0	0.0	36.9
OH	A0	whod	0.0	0.0	0.0	0.0	0.0	0.6	**96.9**	0.0	0.0	1.3	1.3	0.0
OH	A0	heard	0.0	0.0	0.0	0.6	0.0	0.0	0.0	**99.4**	0.0	0.0	0.0	0.0
OH	A0	hide	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	**97.5**	0.0	0.0	1.9
OH	A0	hoed	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.6	0.0	**97.5**	0.6	0.0
OH	A0	hood	0.0	0.0	0.0	0.0	0.6	0.0	0.0	2.5	0.0	0.0	**96.9**	0.0
OH	A0	hawed	0.0	0.0	0.0	0.0	1.9	40.0	0.0	0.0	0.0	0.0	0.0	**58.1**

Table 3.1 displays the Central Ohio listeners' responses to the Central Ohio children (ages 8-12) stimuli. The overall accuracy was extremely high; many of the percent correct reached the ceiling level. 97.5% of the listeners correctly identified the following words: *heed* (/i/), *hide* (/aɪ/), and *hoed* (/o/). The stimulus *had* (/æ/) was correctly identified by 98.8% of the listeners. Of the highest accuracy, the 99.4% of the listeners correctly identified *heard* (vowel /ɝ/).

Also shown in Table 3.1 are the Central Ohio listeners' responses to the Southeastern Wisconsin children (ages 8-12) stimuli. Very similar to that of the Ohio stimuli, the overall accuracy was extremely high also reaching ceiling level. 96.9% of the listeners correctly identified the word *heed* (/i/). 97.5% of the listeners correctly identified the following words: *had* (/æ/), *hide* (/aɪ/), and *heard* (/ɝ/). The word *hoed* (/o/) was

correctly identified by 98.1% of the listeners, making it the most accurately chosen word/vowel. There were also vowels that were frequently confused and will be discussed later on. Despite the Ohio listeners' high accuracy on both the Ohio and Wisconsin stimuli, the listeners performed slightly better when the stimuli were from their own native Ohio dialect.

Table 3.2

Age Group of Speakers: Adults/ Parents (ages 35-50)

Listeners:OH young adults, hVd_vowel_ID, responding to WI and OH speakers (males and females)														
dialect	**spk_age**	**intended**	**HEED**	**HID**	**HEYD**	**HEAD**	**HAD**	**HOD**	**WHOD**	**HEARD**	**HIDE**	**HOED**	**HOOD**	**HAWED**
WI	A2	heed	**95.6**	1.9	0.6	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0
WI	A2	hid	0.0	**94.4**	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0
WI	A2	heyd	10.6	1.3	**80.0**	7.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WI	A2	head	0.0	0.0	0.0	**76.3**	23.1	0.0	0.0	0.0	0.0	0.0	0.6	0.0
WI	A2	had	0.0	0.0	0.0	1.9	**98.1**	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WI	A2	hod	0.0	0.0	0.0	0.0	23.8	**55.6**	0.0	0.0	6.3	0.0	0.0	14.4
WI	A2	whod	0.0	0.0	0.0	0.0	0.0	0.0	**85.0**	0.0	0.0	1.3	13.8	0.0
WI	A2	heard	0.0	0.0	0.0	0.6	0.0	0.0	0.0	**99.4**	0.0	0.0	0.0	0.0
WI	A2	hide	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	**99.4**	0.0	0.0	0.0
WI	A2	hoed	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	**96.9**	1.9	0.0
WI	A2	hood	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	**99.4**	0.0
WI	A2	hawed	0.0	0.0	0.0	0.0	3.1	54.4	0.0	0.0	0.0	0.0	0.0	**42.5**
OH	A2	heed	**92.5**	5.6	0.6	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OH	A2	hid	0.0	**83.1**	0.0	16.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OH	A2	heyd	0.0	0.0	**98.1**	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OH	A2	head	0.0	0.0	0.0	**89.4**	10.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0
OH	A2	had	0.0	0.0	0.0	0.0	**100.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OH	A2	hod	0.0	0.0	0.0	0.0	5.6	**73.8**	0.0	0.0	0.6	0.0	0.0	20.0
OH	A2	whod	0.0	0.0	0.0	0.0	0.0	0.0	**95.0**	0.0	0.0	0.6	4.4	0.0
OH	A2	heard	0.0	0.0	0.0	1.3	0.0	0.0	0.0	**98.8**	0.0	0.0	0.0	0.0
OH	A2	hide	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**100.0**	0.0	0.0	0.0
OH	A2	hoed	0.0	0.0	0.0	0.0	0.0	1.3	0.6	0.6	0.0	**97.5**	0.0	0.0
OH	A2	hood	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	**99.4**	0.0
OH	A2	hawed	0.0	0.0	0.0	0.0	3.8	39.4	0.6	0.0	0.0	0.0	0.0	**56.3**

Table 3.2 displays the Central Ohio listeners' responses to the Central Ohio adults (ages 45-50) stimuli. 98.8% of the listeners correctly identified the word *heard* (/ɜ˞/). 99.4% of the listeners correctly identified the word *hood* (/ʊ/). Two words were identified with perfectly by the listeners each at 100%: *had* (/æ/) and *hide* (/aɪ/).

Also shown in Table 3.2 are the Central Ohio listeners' responses to the Southeastern Wisconsin adults (ages 35-50) stimuli. 98.1% of the listeners correctly

identified the word had (/æ/). The following three words *heard* (/ɝ/), *hide* (/aɪ/), and *hood* (/ʊ/) were all correctly identified 99.4% of the time by the listeners. Like the children stimuli, the identification rate was very high and the listeners did well no matter the stimuli dialect. But, the Ohio listeners' performed slightly better on the Ohio stimuli compared to the Wisconsin Stimuli.

Table 3.3

Age Group of Speakers: Elderly Adults/ Great-grandparents (ages 66-80)

Listeners:OH young adults, hVd_vowel_ID, responding to WI and OH speakers (males and females)														
dialect	**spk_age**	**intended**	**HEED**	**HID**	**HEYD**	**HEAD**	**HAD**	**HOD**	**WHOD**	**HEARD**	**HIDE**	**HOED**	**HOOD**	**HAWED**
WI	A4	heed	**95.6**	3.1	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WI	A4	hid	0.6	**90.0**	0.0	7.5	0.0	0.0	0.0	0.0	0.6	0.0	1.3	0.0
WI	A4	heyd	10.6	3.8	**76.9**	8.1	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0
WI	A4	head	0.0	2.5	0.0	**92.5**	4.4	0.0	0.0	0.0	0.0	0.0	0.6	0.0
WI	A4	had	0.0	0.0	0.0	10.6	**89.4**	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WI	A4	hod	0.0	0.0	0.0	0.0	14.4	**70.0**	0.0	0.0	0.6	0.0	0.0	15.0
WI	A4	whod	0.0	0.0	0.0	0.0	0.0	0.6	**84.4**	0.0	0.0	0.0	15.0	0.0
WI	A4	heard	0.0	0.0	0.0	0.6	0.0	0.0	0.0	**99.4**	0.0	0.0	0.0	0.0
WI	A4	hide	0.0	0.6	0.0	0.6	0.0	0.0	0.0	0.0	**98.8**	0.0	0.0	0.0
WI	A4	hoed	0.0	0.0	0.0	0.0	0.0	0.6	1.9	0.0	0.0	**96.3**	0.6	0.6
WI	A4	hood	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.0	0.6	0.6	**97.5**	0.0
WI	A4	hawed	0.0	0.0	0.0	0.0	1.9	50.6	0.6	0.0	0.0	0.0	0.0	**46.9**
OH	A4	heed	**93.1**	5.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0
OH	A4	hid	0.0	**91.9**	0.0	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0
OH	A4	heyd	0.0	0.0	**93.1**	6.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OH	A4	head	0.0	1.3	2.5	**83.1**	12.5	0.0	0.0	0.0	0.0	0.0	0.6	0.0
OH	A4	had	0.0	0.0	0.0	7.5	**91.9**	0.6	0.0	0.0	0.0	0.0	0.0	0.0
OH	A4	hod	0.0	0.0	0.0	0.0	5.6	**71.3**	0.0	0.0	0.0	0.0	0.0	23.1
OH	A4	whod	0.0	0.0	0.0	0.0	0.0	1.9	**90.6**	0.0	0.0	0.6	6.9	0.0
OH	A4	heard	0.0	0.0	0.0	0.6	0.0	0.0	0.0	**99.4**	0.0	0.0	0.0	0.0
OH	A4	hide	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**100.0**	0.0	0.0	0.0
OH	A4	hoed	0.0	0.0	0.0	0.0	0.0	0.6	1.9	0.0	0.0	**97.5**	0.0	0.0
OH	A4	hood	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.9	0.0	0.0	**97.5**	0.0
OH	A4	hawed	0.0	0.0	0.0	0.0	1.9	37.5	0.0	0.0	0.0	1.9	0.0	**58.8**

Table 3.3 at the top displays the Central Ohio listeners' responses to the Central Ohio elderly adults (ages 66-80) stimuli. The listeners correctly identified the words *hoed* (/o/) and *hood* (/ʊ/) 97.5% of the time. The word *heard* (/ɝ/) was correctly identified by 99.4% of the listeners. Listeners performed even better on the word *hide* (/aɪ/) with a perfect 100% identification.

Shown at the bottom of Table 3.3 are the Central Ohio listeners' responses to the Southeastern Wisconsin elderly adults (ages 66-80) stimuli. The word *hoed* (/o/) was correctly identified by 96.3% of the listeners. The words *hood* (/ʊ/) and *hide* (/aɪ/) also had high identification rates with 97.5% and 98.8% of the listeners respectively. With 99.4% of the listeners correctly identifying, *heard* (/ɝ/) was the Wisconsin stimulus word that received the best identification rate. Just as previously stated in the children and adult stimulus groups, although the over accuracy was high, the Ohio listeners performed slightly better with stimuli from their own native Ohio dialect than that of the non-native Wisconsin dialect.

3.2 Southeastern Wisconsin (Inland North) Listeners' Responses

Tables 3.4 through 3.6 provide the responses of the Wisconsin listeners to both the Ohio and Wisconsin vowels.

Table 3.4

Age Group of Speakers: Children (ages: 8-12)

Listeners:WI young adults, hVd_vowel_ID, responding to WI and OH speakers (males and females)														
dialect	**spk_age**	**intended**	**HEED**	**HID**	**HEYD**	**HEAD**	**HAD**	**HOD**	**WHOD**	**HEARD**	**HIDE**	**HOED**	**HOOD**	**HAWED**
WI	A0	heed	**98.9**	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0
WI	A0	hid	0.0	**88.9**	0.0	9.4	0.0	0.0	0.0	0.0	1.1	0.0	0.6	0.0
WI	A0	heyd	2.8	0.0	**95.6**	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WI	A0	head	0.6	0.6	0.0	**88.9**	8.3	0.0	0.0	1.7	0.0	0.0	0.0	0.0
WI	A0	had	0.0	0.0	0.0	0.6	**99.4**	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WI	A0	hod	0.0	0.0	0.0	0.0	5.6	**80.0**	0.0	0.0	8.9	0.0	0.0	5.6
WI	A0	whod	0.0	0.0	0.0	0.6	0.0	0.0	**97.2**	0.0	0.0	0.0	2.2	0.0
WI	A0	heard	0.0	0.0	0.0	0.6	0.0	0.0	0.0	**99.4**	0.0	0.0	0.0	0.0
WI	A0	hide	0.0	0.6	0.6	0.0	0.6	0.0	0.0	0.0	**98.3**	0.0	0.0	0.0
WI	A0	hoed	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	**98.9**	0.6	0.0
WI	A0	hood	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.0	**97.2**	0.0
WI	A0	hawed	0.0	0.6	0.0	0.0	0.0	45.0	0.0	0.0	2.2	0.0	0.0	**52.2**
OH	A0	heed	**98.9**	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0
OH	A0	hid	0.0	**81.1**	0.6	16.7	0.6	0.0	0.0	0.6	0.6	0.0	0.0	0.0
OH	A0	heyd	0.0	0.6	**95.0**	3.9	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0
OH	A0	head	1.7	0.0	0.0	**86.1**	11.7	0.0	0.0	0.6	0.0	0.0	0.0	0.0
OH	A0	had	0.0	0.0	0.0	2.8	**93.9**	1.7	0.0	0.0	1.7	0.0	0.0	0.0
OH	A0	hod	0.0	0.0	0.6	0.0	0.0	**53.9**	0.0	0.0	2.8	0.0	0.0	42.8
OH	A0	whod	0.0	0.0	0.0	0.0	0.0	0.0	**97.8**	0.0	0.0	0.6	1.7	0.0
OH	A0	heard	0.6	0.0	0.0	0.0	0.0	0.0	0.0	**99.4**	0.0	0.0	0.0	0.0
OH	A0	hide	0.0	0.0	1.1	0.0	0.0	2.8	0.0	0.0	**94.4**	0.0	0.0	1.7
OH	A0	hoed	0.0	0.0	0.0	0.0	0.0	0.6	2.2	0.0	0.0	**96.7**	0.6	0.0
OH	A0	hood	0.0	0.0	0.0	0.0	0.0	1.1	0.0	3.9	0.0	0.0	**95.0**	0.0
OH	A0	hawed	0.0	0.0	0.6	0.0	0.0	35.6	0.0	0.0	0.6	0.0	0.0	**63.3**

Table 3.4 displays the Southeastern Wisconsin listeners' responses to the Central Ohio children (ages 8-12) stimuli. The listeners correctly identified the word *hoed* (/o/) at a correct indemnification rate of 96.7%. This was the first matrix that included the word *who'd* (/u/) with the listeners correctly identifying it 97.8% of the time. 98.9% of the listeners correctly identified the word *heed* (/i/). Even more accurate, was the listeners ability to correctly identify the word *heard* (/ɝ/) 99.4% of the time.

Also shown in the lower half of Table 3.4 is the Southeastern Wisconsin listeners' responses to the Southeastern Wisconsin children (ages 8-12) stimuli. The word *hide* (/aɪ/) was correctly identified by the listeners at a rate of 98.3%. Similarly, 98.9% of the listeners correctly identified both words *heed* (/i/) and *hoed* (/o/). The word *heard* (/ɝ/) was correctly identified by 99.4% of the listeners. The overall accuracy of both dialectal

stimuli was high. However, the Wisconsin listeners performed slightly more accurate on the Wisconsin stimuli than that of the stimuli from the Ohio dialect.

Table 3.5

Age Group of Speakers: Adults/ Parents (ages 35-50)

Listeners:WI young adults, hVd_vowel_ID, responding to WI and OH speakers (males and females)														
dialect	**spk_age**	**intended**	**HEED**	**HID**	**HEYD**	**HEAD**	**HAD**	**HOD**	**WHOD**	**HEARD**	**HIDE**	**HOED**	**HOOD**	**HAWED**
WI	A2	heed	**97.8**	0.6	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WI	A2	hid	0.0	**95.6**	0.0	3.9	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WI	A2	heyd	6.7	0.6	**88.3**	2.2	0.6	0.0	0.0	0.0	0.6	0.6	0.0	0.6
WI	A2	head	0.0	0.0	0.0	**83.9**	15.6	0.0	0.0	0.6	0.0	0.0	0.0	0.0
WI	A2	had	0.0	0.0	0.0	0.0	**98.9**	1.1	0.0	0.0	0.0	0.0	0.0	0.0
WI	A2	hod	0.0	0.6	0.6	0.0	5.0	**78.9**	0.0	0.0	12.8	0.0	0.0	2.2
WI	A2	whod	0.0	0.0	0.0	0.6	0.0	0.6	**93.3**	0.0	0.0	0.0	5.6	0.0
WI	A2	heard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**100.0**	0.0	0.0	0.0	0.0
WI	A2	hide	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	**98.9**	0.0	0.0	0.0
WI	A2	hoed	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.6	0.0	**97.2**	0.6	0.0
WI	A2	hood	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	**98.9**	0.6
WI	A2	hawed	0.0	0.0	0.0	0.0	0.6	35.0	0.0	0.0	1.7	0.0	0.0	**62.8**
OH	A2	heed	**95.0**	2.8	1.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OH	A2	hid	0.0	**84.4**	0.0	13.9	0.0	0.0	0.0	0.6	0.6	0.0	0.6	0.0
OH	A2	heyd	0.0	0.6	**99.4**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OH	A2	head	0.6	0.0	0.0	**87.2**	11.1	0.0	0.0	1.1	0.0	0.0	0.0	0.0
OH	A2	had	0.0	0.0	0.0	1.1	**98.3**	0.6	0.0	0.0	0.0	0.0	0.0	0.0
OH	A2	hod	0.0	0.0	0.0	0.0	1.7	**78.9**	0.0	0.0	5.6	0.0	0.0	13.9
OH	A2	whod	0.0	0.0	0.0	0.0	0.0	0.6	**96.7**	0.0	0.0	0.6	2.2	0.0
OH	A2	heard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**100.0**	0.0	0.0	0.0	0.0
OH	A2	hide	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**100.0**	0.0	0.0	0.0
OH	A2	hoed	0.0	0.0	0.0	0.0	0.0	1.1	0.6	0.0	0.0	**98.3**	0.0	0.0
OH	A2	hood	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.6	**98.9**	0.0
OH	A2	hawed	0.0	0.0	0.0	0.0	0.6	28.9	0.0	0.0	0.0	0.6	0.0	**70.0**

The upper half of Table 3.5 shows the Southeastern Wisconsin listeners' responses to the Central Ohio adults (ages 35-50) stimuli. 98.9% of the listeners correctly identified the word *hood* (/ʊ/). This was the first matrix that included the word *hey'd* (/eɪ/) with the listeners correctly identifying it 99.4% of the time. Both stimulus words *heard* (/ɝ/) and *hide* (/aɪ/) were correctly identified 100% of the time by the listeners.

Shown in the lower half of Table 3.5 is the Southeastern Wisconsin listeners' responses to the Southeastern Wisconsin adults (ages 35-50) stimuli. The following three words were correctly identified by 98.9% of the listeners, *had* (/æ/), *hide* (/aɪ/), and *hood*

(/ʊ/). Stimulus word *heard* (/ɜ˞/) was identified correctly by 100% of the listeners.

Differing from the recognition and identification pattern building throughout matrix after matrix, the Wisconsin listeners actually performed slightly better on the Ohio stimuli as compared to their counterpart, the Wisconsin stimuli.

Table 3.6

Age Group of Speakers: Elderly Adults/ Great-grandparents (ages 66-80)

Listeners:WI young adults, hVd_vowel_ID, responding to WI and OH speakers (males and females)														
dialect	**spk_age**	**intended**	**HEED**	**HID**	**HEYD**	**HEAD**	**HAD**	**HOD**	**WHOD**	**HEARD**	**HIDE**	**HOED**	**HOOD**	**HAWED**
WI	A4	heed	**98.9**	0.6	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WI	A4	hid	0.0	**89.4**	0.0	8.3	0.0	0.6	0.0	0.6	1.1	0.0	0.0	0.0
WI	A4	heyd	10.0	3.3	**85.0**	0.6	0.6	0.0	0.0	0.6	0.0	0.0	0.0	0.0
WI	A4	head	0.0	8.3	0.0	**86.7**	3.3	0.0	0.0	1.1	0.0	0.6	0.0	0.0
WI	A4	had	0.0	0.0	0.0	8.3	**91.1**	0.0	0.0	0.6	0.0	0.0	0.0	0.0
WI	A4	hod	0.0	0.0	0.6	0.0	1.7	**85.0**	0.0	0.6	7.8	0.0	0.0	4.4
WI	A4	whod	0.0	0.0	0.0	0.0	0.0	0.6	**94.4**	0.0	0.0	0.0	5.0	0.0
WI	A4	heard	0.0	0.0	0.0	1.7	0.0	0.0	0.0	**98.3**	0.0	0.0	0.0	0.0
WI	A4	hide	0.0	1.1	1.7	0.0	0.0	0.0	0.0	0.0	**97.2**	0.0	0.0	0.0
WI	A4	hoed	0.0	0.0	0.0	0.0	0.0	1.7	0.6	0.0	0.0	**96.7**	0.6	0.6
WI	A4	hood	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.0	0.0	0.0	**98.9**	0.0
WI	A4	hawed	0.0	0.0	0.0	0.0	0.0	32.8	0.0	0.0	1.1	0.0	0.6	**65.6**
OH	A4	heed	**98.3**	1.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OH	A4	hid	0.6	**90.6**	0.0	7.8	0.0	0.0	0.0	0.6	0.6	0.0	0.0	0.0
OH	A4	heyd	1.1	0.0	**96.1**	1.7	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OH	A4	head	0.0	3.3	2.8	**75.0**	18.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OH	A4	had	0.0	0.0	0.0	2.8	**96.1**	0.6	0.0	0.0	0.0	0.0	0.0	0.6
OH	A4	hod	0.0	0.0	0.6	0.0	0.6	**71.1**	0.0	0.0	3.3	0.0	0.0	24.4
OH	A4	whod	0.0	0.0	0.0	0.0	0.0	0.6	**96.7**	0.0	0.0	0.0	2.8	0.0
OH	A4	heard	0.0	0.0	0.0	0.6	0.0	0.0	0.0	**99.4**	0.0	0.0	0.0	0.0
OH	A4	hide	0.0	1.1	0.6	0.0	0.0	0.0	0.0	0.0	**98.3**	0.0	0.0	0.0
OH	A4	hoed	0.0	0.0	0.0	0.0	0.0	1.1	1.1	0.0	0.0	**96.1**	1.1	0.6
OH	A4	hood	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.6	0.0	0.6	**96.1**	0.0
OH	A4	hawed	0.0	0.0	0.0	0.0	1.1	39.4	0.0	0.0	1.7	2.8	0.0	**55.0**

The upper portion of Table 3.6 displays the Southeastern Wisconsin listeners' responses to the Central Ohio elderly adults (ages 66-80) stimuli. 96.7% of the listeners correctly identified the word *who'd* (/u/). Both the words *had* (vowel /æ/) and *hide* (/aɪ/) were correctly identified by 98.3% of the listeners. The best listener performance was on the word *heard* (/ɜ˞/) with 99.4% of the listeners identifying it correctly.

The lower portion of Table 3.6 shows the Southeastern Wisconsin listeners' responses to the Southeastern Wisconsin elderly adults (ages 66-80) stimuli. The word *hide* (/aɪ/) was correctly identified by 97.2% of the listeners while 98.3% of the listeners correctly identified the word *heard* (/ɝ/). The two words *heed* (/i/) and *hood* (/ʊ/) were correctly identified by 98.9% of the listeners. Since 98.9% was the highest percentage of listeners to correctly identify a word/vowel, 98.9% was the lowest highest percent of all six confusion matrices. The Wisconsin listeners had the most difficulty in identifying words from the eldest stimuli from their own native dialect. Although each matrix varies in percent correctness, nearly all responses were high. However, there were certain words that were often confused. In the following section will discuss these confusions in depth.

3.3 Patterns of Confusions for Selected Vowels: Ohio Vowels

In order to examine the confusions more in depth, we selected a group of vowels most confused with one another to examine. We will look at a set of front vowels and a separate set of back vowels.

Front Vowels

Table 3.7: Confusions among Front Vowels Produced by Ohio Speakers

			Front Vowels									
			Ohio Listeners Response					Wisconsin Listeners Response				
Speaker dialect	Speaker age	Token played	HEED	HID	HEYD	HEAD	HAD	HEED	HID	HEYD	HEAD	HAD
OH	66_80	hid		**91.9**		7.5		0.6	**90.6**		7.8	
OH	66_80	heyd			**93.1**	6.9		1.1		**96.1**	1.7	1.1
OH	66_80	head		1.3	2.5	**83.1**	12.5		3.3	2.8	**75.0**	18.9
OH	66_80	had				7.5	**91.9**				2.8	**96.1**
OH	35_50	hid		**83.1**		16.9			**84.4**		13.9	
OH	35_50	heyd			**98.1**	1.9			0.6	**99.4**		
OH	35_50	head				**89.4**	10.0	0.6			**87.2**	11.1
OH	35_50	had					**100.0**				1.1	**98.3**
OH	8_12	hid		**73.8**	1.9	23.8			**81.1**	0.6	16.7	0.6
OH	8_12	heyd			**91.3**	6.3	0.6		0.6	**95.0**	3.9	
OH	8_12	head				**91.3**	8.8	1.7			**86.1**	11.7
OH	8_12	had				0.6	**98.8**				2.8	**93.9**

Table 3.7 shows both Ohio and Wisconsin listeners' responses to the following Ohio stimuli: *hid, hey'd, head*, and *had*. All three of the age groups appear on the matrix. Overall, the Wisconsin listeners performed slightly better than the Ohio listeners. The listeners, both Ohio and Wisconsin, performed the best with the stimulus age group of the adults (35-50). The listeners, both Ohio and Wisconsin, made the most confusions with the stimulus age group of the children (8-12).

Back Vowels

Table 3.8: Confusions among Back Vowels Produced by Ohio Speakers

			Back Vowels									
			Ohio Listeners Response					Wisconsin Listeners Response				
Speaker dialect	Speaker age	Token played	WHOD	HOD	HIDE	HOOD	HAWED	WHOD	HOD	HIDE	HOOD	HAWED
OH	66_80	hod		71.3			23.1		71.1	3.3		24.4
OH	66_80	hide			100.0					98.3		
OH	66_80	hood	0.6			97.5		2.8			96.1	
OH	66_80	hawed		37.5			58.8		39.4	1.7		55.0
OH	35_50	hod		73.8	0.6		20.0		78.9	5.6		13.9
OH	35_50	hide			100.0					100.0		
OH	35_50	hood		0.6		99.4					98.9	
OH	35_50	hawed	0.6	39.4			56.3		28.9			70.0
OH	8_12	hod		57.5	0.6		36.9		53.9	2.8		42.8
OH	8_12	hide		0.6	97.5		1.9		2.8	94.4		1.7
OH	8_12	hood				96.9			1.1		95.0	
OH	8_12	hawed		40.0			58.1		35.6	0.6		63.3

Table 3.8 shows both Ohio and Wisconsin listeners responses to the following Ohio stimuli: *hod, hide, hood,* and *hawed*. All three of the age groups appear on the matrix. Overall, the Ohio listeners performed slightly better than the Wisconsin listeners. The listeners, both Ohio and Wisconsin, performed the best with the stimulus age group of the adults (35-50). The listeners, both Ohio and Wisconsin, made the most confusions with the stimulus age group of the elderly adults (66-80).

3.4 Patterns of Confusions for Selected Vowels: Wisconsin Stimuli

Front Vowels

Table 3.9: Confusions among Front Vowels Produced by Wisconsin Speakers

			Front Vowels									
			Wisconsin Listeners Response					Ohio Listeners Response				
Speaker dialect	Speaker age	Token played	HEED	HID	HEYD	HEAD	HAD	HEED	HID	HEYD	HEAD	HAD
WI	66_80	hid		**89.4**		8.3		0.6	**90.0**		7.5	
WI	66_80	heyd	10.0	3.3	**85.0**	0.6	0.6	10.6	3.8	**76.9**	8.1	
WI	66_80	head		8.3		**86.7**	3.3		2.5		**92.5**	4.4
WI	66_80	had				8.3	**91.1**				10.6	**89.4**
WI	35_50	hid		**95.6**		3.9	0.6		**94.4**		5.0	
WI	35_50	heyd	6.7	0.6	**88.3**	2.2	0.6	10.6	1.3	**80.0**	7.5	0.6
WI	35_50	head				**83.9**	15.6				**76.3**	23.1
WI	35_50	had					**98.9**				1.9	**98.1**
WI	8_12	hid		**88.9**		9.4		0.6	**83.8**		15.6	0.6
WI	8_12	heyd	2.8		**95.6**	1.7		1.3	1.9	**91.3**	3.8	
WI	8_12	head	0.6	0.6		**88.9**	8.3		0.6		**80.0**	18.8
WI	8_12	had				0.6	**99.4**				2.5	**97.5**

Table 3.9 shows both Ohio and Wisconsin listeners' responses to the following Wisconsin stimuli: *hid, hey'd, head*, and *had*. All three of the age groups appear on the matrix. Overall, the Wisconsin listeners performed slightly better than the Ohio listeners. The listeners, both Ohio and Wisconsin, performed the best with the stimulus age group of the children (8-12). The listeners, both Ohio and Wisconsin, made the most confusions with the stimulus age group of the elderly adults (66-80).

Back Vowels

Table 3.10: Confusions among Back Vowels Produced by Wisconsin Speakers

			Back Vowels									
			Wisconsin Listeners Response					Ohio Listeners Response				
Speaker dialect	Speaker age	Token played	WHOD	HOD	HIDE	HOOD	HAWED	WHOD	HOD	HIDE	HOOD	HAWED
WI	66_80	hod		**85.0**	7.8		4.4		**70.0**	0.6		15.0
WI	66_80	hide			**97.2**					**98.8**		
WI	66_80	hood	0.6	0.6		**98.9**		0.6	0.6	0.6	**97.5**	
WI	66_80	hawed		32.8	1.1	0.6	**65.6**	0.6	50.6			**46.9**
WI	35_50	hod		**78.9**	12.8		2.2		**55.6**	6.3		14.4
WI	35_50	hide			**98.9**					**99.4**		
WI	35_50	hood				**98.9**	0.6		0.6		**99.4**	
WI	35_50	hawed		35.0	1.7		**62.8**		54.4			**42.5**
WI	8_12	hod		**80.0**	8.9		5.6		**56.3**	8.1		16.9
WI	8_12	hide			**98.3**					**97.5**		
WI	8_12	hood				**97.2**			1.9		**94.4**	
WI	8_12	hawed		45.0	2.2		**52.2**		57.5			**37.5**

Table 3.10 shows both Ohio and Wisconsin listeners responses to the following Wisconsin stimuli: *hod, hide, hood*, and *hawed*. All three of the age groups appear on the matrix. Overall, the Wisconsin listeners performed slightly better than the Ohio listeners. The listeners, both Ohio and Wisconsin, performed the best with the stimulus age group of the elderly adult (66-80). The listeners, both Ohio and Wisconsin, made the most confusions with the stimulus age group of the children (8-12).

3.5 Patterns of Confusions among Selected Vowels with Highest Number of Confusions

hid

The patterns of identifications and confusions were slightly different for each dialectal variant. While responding to Ohio *hid*, both Ohio and Wisconsin listeners confused it most often with head but their confusions showed cross-generational differences (compare Figure 3.1). These cross-generational differences were not found when responding to Wisconsin *hid* (Figure 3.2).

Figure 3.1

A graph of the single word *hid* in Ohio dialect, two of which shows the Ohio and Wisconsin listeners percentage response of *hid* compared to *head,* which it was often confused. It also shows confusion cross-generationally.

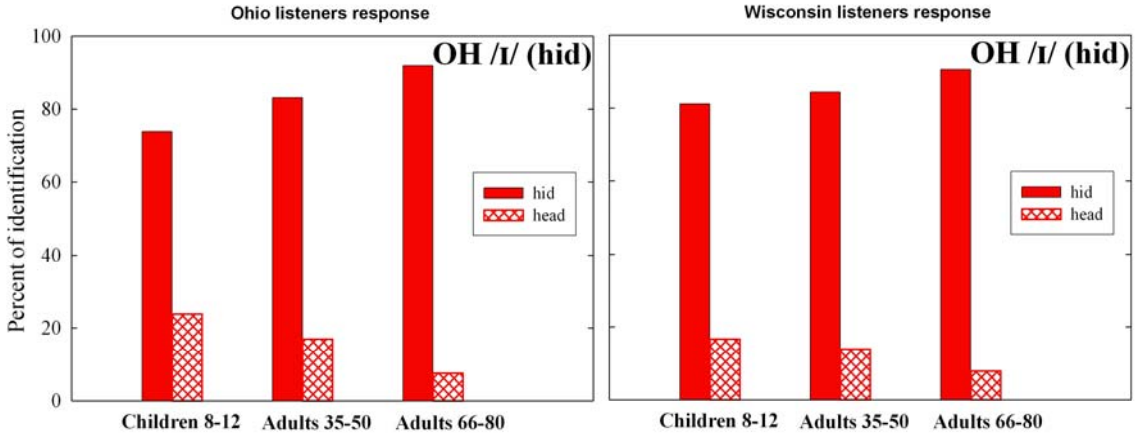
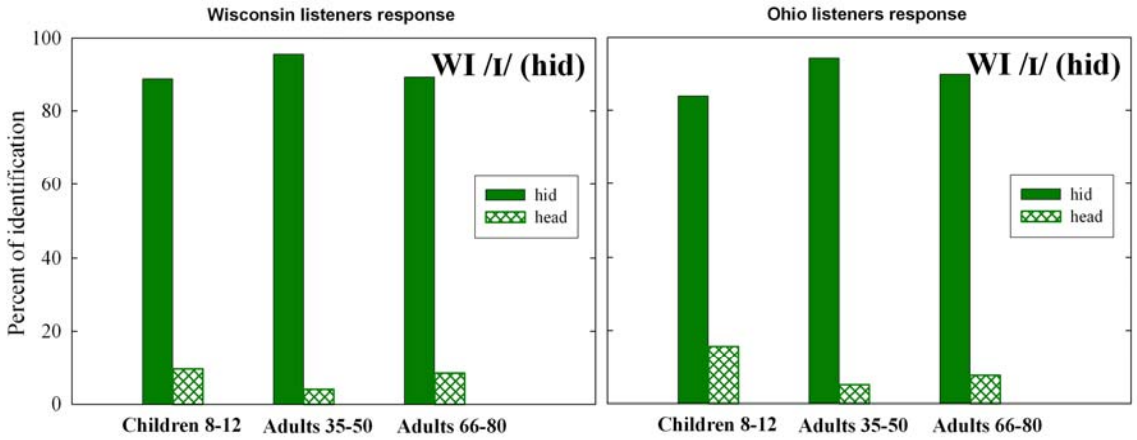


Figure 3.2

A graph of the single word *hid* in Wisconsin dialect, two of which shows the Ohio and Wisconsin listeners percentage response of *hid* compared to *head,* which it was often confused. It also shows confusion cross-generationally.



head

The vowel in *head* was confused mostly with the vowel in *had* and the confusions were most numerous for Ohio listeners responding to the Wisconsin variant as spoken by children and their parents' generation (see Figure 3.4). This indicates that some dialectal differences were detectable by Ohio listeners. Also, compare Wisconsin listeners' response to Ohio *head* spoken by the old speakers' generation (see Figure 3.3).

Figure 3.3

A graph of the single word *head* in Ohio dialect, two of which shows the Ohio and Wisconsin listeners' percentage response of *head* compared to *had,* which it was often confused. It also shows confusion cross-generationally.

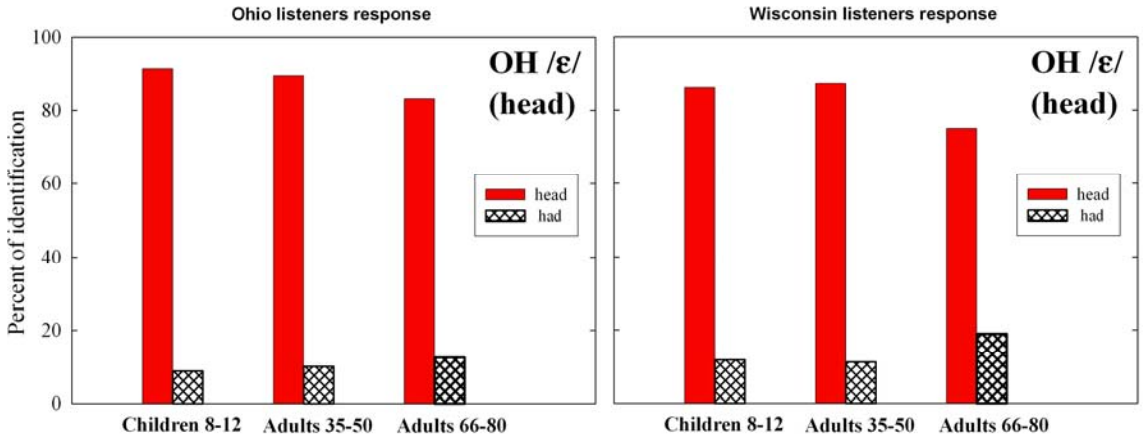
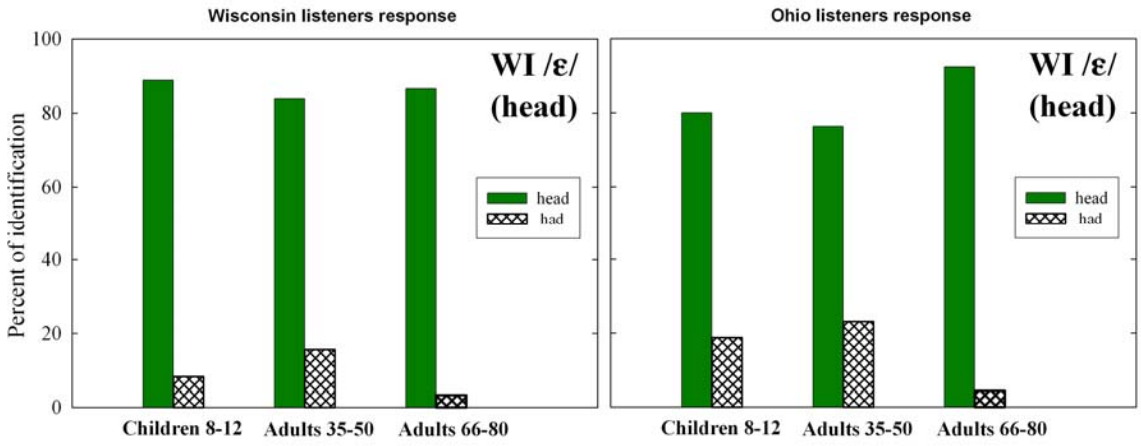


Figure 3.4

A graph of the single word *head* in Wisconsin dialect, two of which shows the Ohio and Wisconsin listeners' percentage response of *head* compared to *had,* which it was often confused. It also shows confusion cross-generationally.



hawed

The vowel in *hawed* was confused with *hod* to a much greater extent than any other vowel in the set. This was true for both Ohio and Wisconsin variants and for both Ohio and Wisconsin listeners. However, clear dialectal differences in listeners' responses were found. The accuracy of Wisconsin listeners was slightly greater than Ohio listeners when responding to the Ohio variant (see Figure 3.5). Also, Ohio listeners identified the Wisconsin *hawed* as *hod* more often than the intended *hawed* as opposed to the Wisconsin listeners, who were more accurate (see Figure 3.6).

Figure 3.5

A graph of the single word *hawed* in Ohio dialect, two of which shows the Ohio and Wisconsin listeners' percentage response of *hawed* compared to *hod and had,* which it was often confused. It also shows confusion cross-generationally.

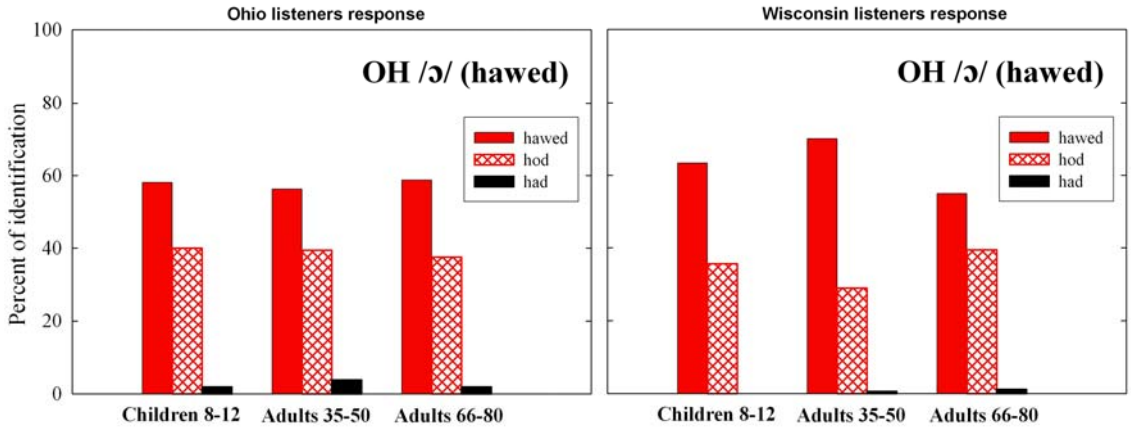
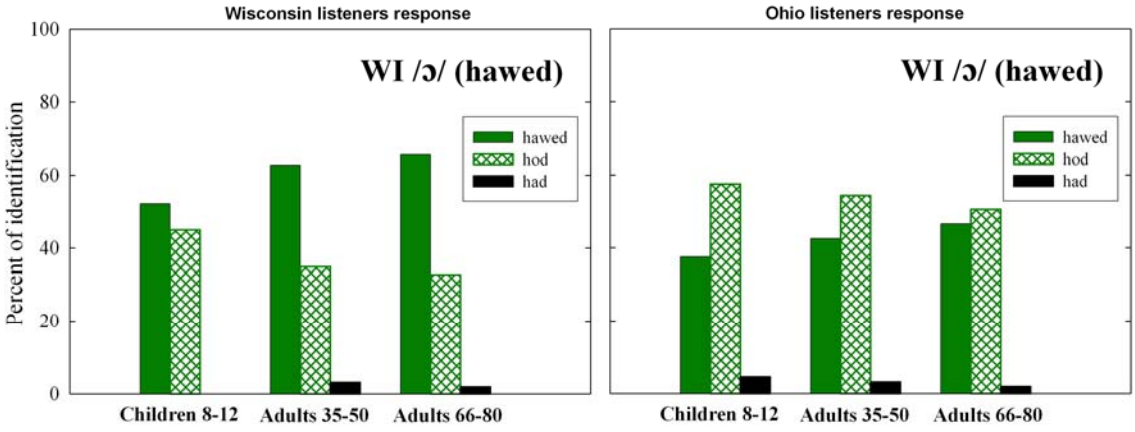


Figure 3.6

A graph of the single word *hawed* in Wisconsin dialect, two of which shows the Ohio and Wisconsin listeners percentage response of *hawed* compared to *hod and had,* which it was often confused. It also shows confusion cross-generationally.



hod

Cross-dialectal differences in were also found for *hod* in terms of both accuracy and the nature of confusions (compare the patterns in Figures 3.7 and 3.8). In the Ohio Stimulus, both Ohio and Wisconsin listeners' confused *hod* with *hawed*, especially in the child age

group. In the Wisconsin Stimulus, *hod* and was most often confused with had by both Ohio and Wisconsin listeners; however, it is confused more often by the Ohio listeners than the Wisconsin listeners.

Figure 3.7

A graph of the single word *hod* in Ohio dialect, two of which shows the Ohio and Wisconsin listeners percentage response of *hod* compared to *hawed and had,* which it was often confused. It also shows confusion cross-generationally.

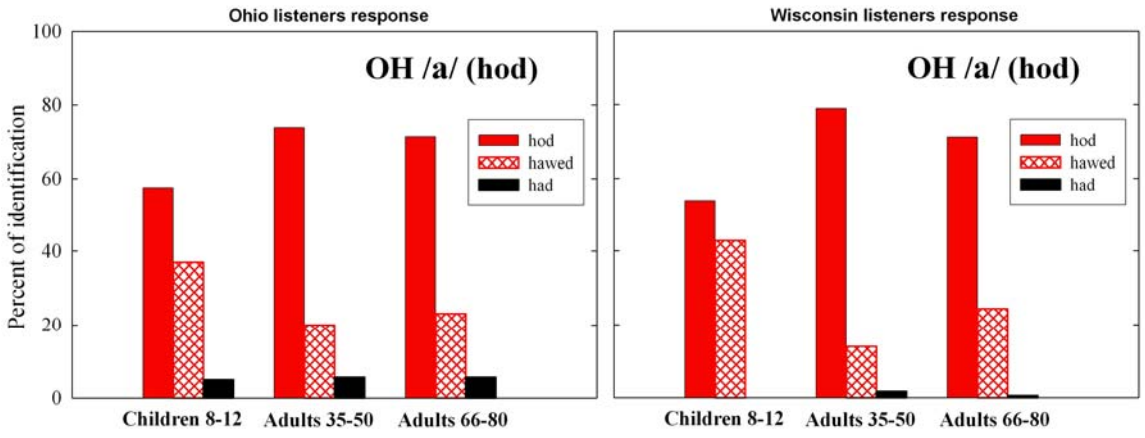
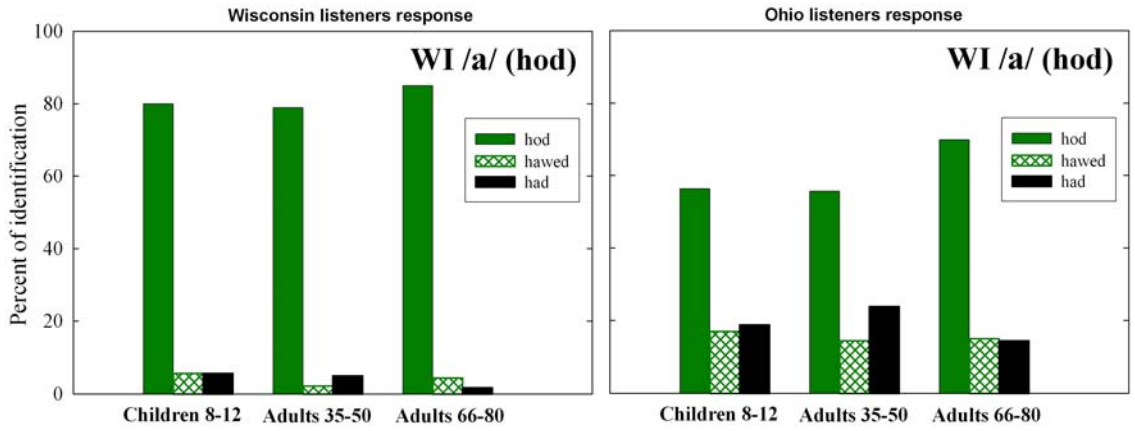


Figure 3.8

A graph of the single word *hod* in Wisconsin dialect, two of which shows the Ohio and Wisconsin listeners percentage response of *hod* compared to *hawed and had,* which it was often confused. It also shows confusion cross-generationally.



3.6 Conclusion and Summary:

The two Midwestern dialects spoken in central Ohio and southern Wisconsin show great similarities. The pronunciation of most vowels in both dialects does not differ significantly so that listeners are often not aware of dialectal differences. This means that although there are two distinct dialects (whose systematic differences can be described by linguists and speech scientists, as well as other careful observers), their differences are too minimal to affect the naive listener. However, the pattern of responses and confusion to selected vowels indicates that some dialectal differences do exist and listeners are sensitive to making linguistic decisions regarding dialect even if the dialects are closely related to one another. These slight differences between the Midland and Inland North dialects may thus impact the nature of the vowel confusion patterns found. This study has just opened the door to what possible research could be done on this topic. In fact, further research is currently in the works in order to further examine the slight dialectal differences of the Midland and Inland North.

Chapter 4. ACKNOWLEDGEMENTS

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Chapter 6. INDEX OF TABLES AND FIGURES